# Pearson Creek
# Stream Restoration Plan

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## INTRODUCTION

The Chamberlain Creek Watershed has been the focus of native trout conservations actions for over 20 years. Conservation actions include the restoration of instream habitat, riparian grazing changes, the restoration of instream flows through water leases, the reclamation of stream-side roads and the placement of conservation easements on all private and State (DNRC) lands within the basin. These activities have converted Chamberlain Creek from a highly degraded tributary to a stream supporting a robust westslope cutthroat trout population, which now includes a large migratory component with the Blackfoot River.

Pearson Creek is the largest tributary to Chamberlain Creek. Like Chamberlain Creek, Pearson Creek has been the focus of many cutthroat trout conservation actions. However, unlike Chamberlain Creek, Pearson Creek still requires additional habitat restoration activities in order to offset adverse human activities and restore habitat for westslope cutthroat trout. Additional restoration needs apply to the lower portion of the stream on the Heart-Bar-Heart Ranch where a small section of channel has been highly altered by channelization, past farming and the adverse effects of an undersized culvert. In addition to restoration needs in this localized area, Pearson Creek will be protected from livestock pressure and recover cutthroat trout habitat.

## PROJECT AREA

Pearson Creek is a small second-order tributary to Chamberlain Creek located about five miles west of the town of Ovando, Montana in Powell County (Figure 1). Pearson Creek originates from the Garnet Mountains and its mainstem flows for nine miles through primarily State lands before entering private ranch land (Heart-Heart) (mile 2.0) with a base-flow of about one cfs. The headwaters of Pearson Creek support coniferous forest, whereas the lower stream flows through prairie parkland. Native riparian plant species include ponderosa pine, Douglas fir, western Larch, quaking aspen, as well as various shrubs (willow *spp*., red-osier dogwood, hawthorne and alder) forbs, sedges and gramminoids, including the increasing presence of nonnative pasture grasses in the downstream direction. Primary land uses in upper Pearson Creek include timber production and public recreation, versus hay and livestock production on the private lands in the lower basin.

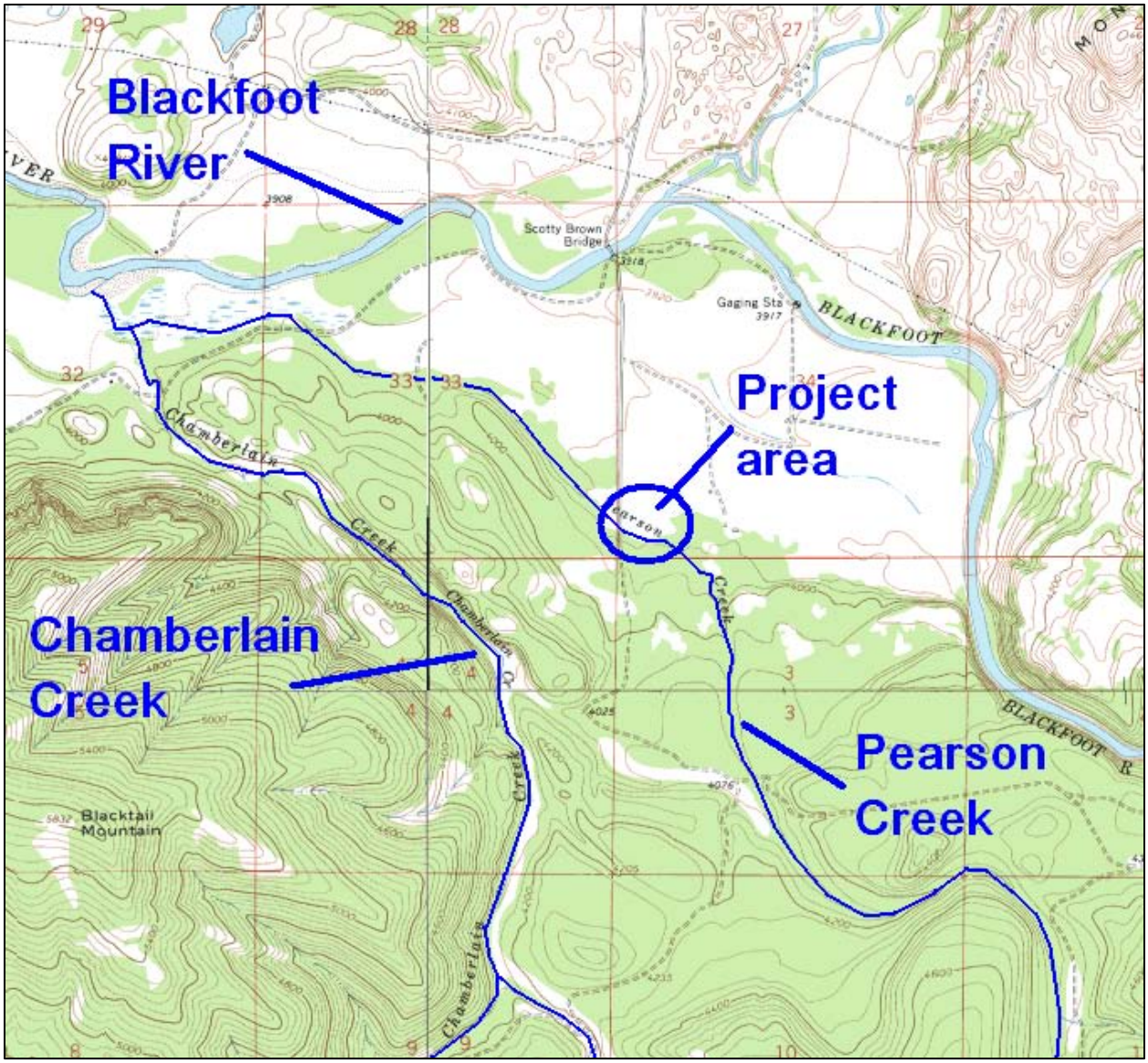


**Figure 1**. This map shows the Pearson Creek project and surrounding area. The project focuses on Pearson Creek from the country road upstream.

**RESTORATION NEEDS**

Past restoration activities on Pearson Creek include a donated water lease, reconstruction and restoration of streams, riparian revegation and grazing management. Despite these changes, unresolved localized (human-induced) channel alterations combined with the influence of an undersized culvert continue to hamper the recovery of westslope cutthroat trout in Pearson Creek. This project will correct these channel alterations by restoring natural channel form, function and flow regimes to this reach of stream.

Channel restoration is required on a 1,244 foot section of Pearson Creek that has been bermed and is also entrenched in sections (Photo 1 & Figure 2). The bermed channel drains into a

wetland with no defined channel before returning back to Pearson Creek along the River Junction Road borrow pit and finally through an undersized culvert. Upstream of the wetland, the bermed channel also loses about 50% of high flows through holes in the berm. This water flows overland and then returns to Pearson Creek through a ditch before entering the undersized culvert. This loss of high water occurs during the cutthroat trout migration period and appears to result in the loss migrant westslope cutthroat trout from the stream (Photo 2). Montana Fish, Wildlife and Parks biologists have measured velocities through the culvert at > 6 feet-per-second during the cutthroat trout migration period. These velocities are high enough to prevent the upstream movement of migratory fish from ascending the stream into upstream spawning areas during certain high flow events.

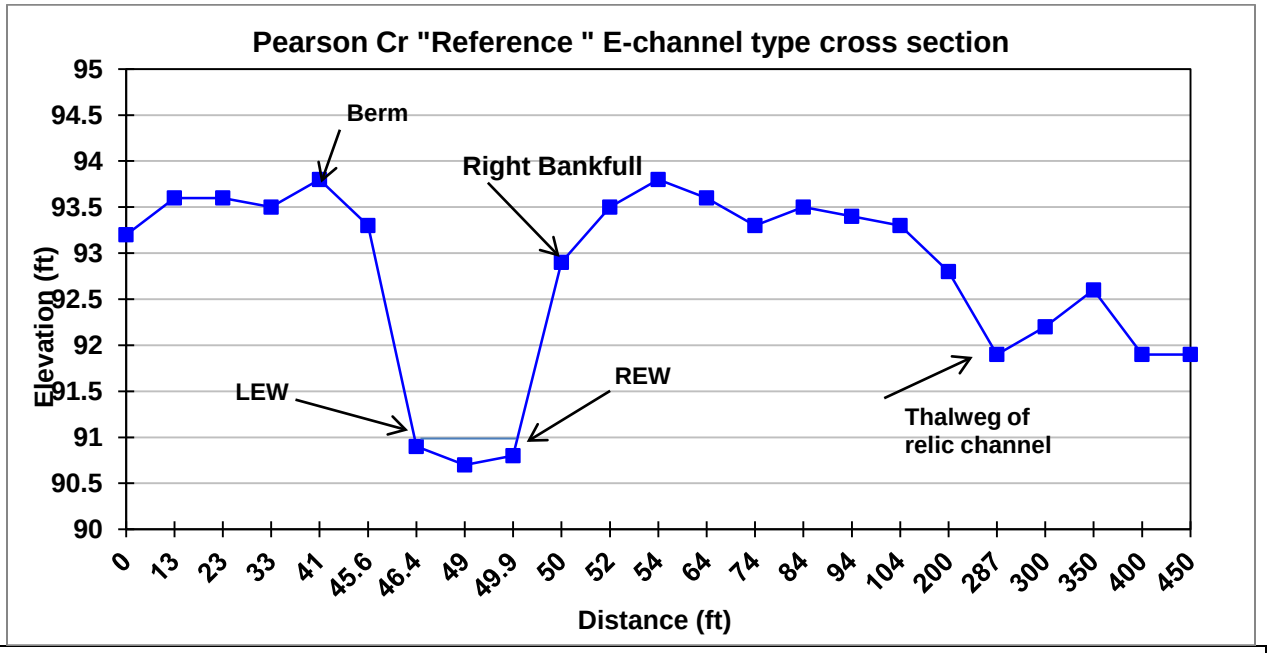


**Figure 2**: Valley cross-section showing existing bermed and historic channels on Pearson Creek. We are proposing to incorporate segments of the relic channel into the new channel layout.


**Photo 1**: This photo shows a section of Pearson Creek where channelization and berms are impacting the stream. Notice the loss of water from gaps in the berm.

**Photo 2**: This photo shows water lost from the main (i.e., perched) Pearson Creek channel during the spring runoff. The proposed new channel will be constructed within this channel, which is likely a segment of the historical channel.

**PEARSON CREEK FISHERIES**

Like Chamberlain Creek, westslope cutthroat trout is the prevalent salmonid within Pearson Creek. Other species present include long-nosed sucker and nonnative brook trout, both of which occupy the lower basin in low abundance. The genetic composition of cutthroat trout in Pearson Creek consists of 98% westslope cutthroat trout and 2% rainbow trout (FWP data services). Westslope cutthroat trout in Pearson Creek include both resident and migratory (fluvial) westslope cutthroat. However, the population in lower Pearson appears to be suppressed due to human manipulations of spawning, rearing and migratory corridors due to channel alterations. Fish population surveys show estimates of abundance decrease from a six-year average density of 18.6 (range, 10.6-23.3) age $\geq$1 fish/100' stream immediately upstream of the proposed treatment area to a six-year average of 4.5 (range, 0-7.7) age $\geq$1 fish/100' downstream of the proposed treatment area. This represents a long-term 75% reduction in the abundance of cutthroat trout over a short (0.6 mile) distance.

## GOALS AND OBJECTIVES

**Restoration Goal:** The goal of the Pearson Creek project is to restore natural channel form and function in the area of channel alterations in order to restore movement corridors habitat for westslope cutthroat trout.

**Objective 1**: Restore natural streams and instream habitat features to Pearson Creek using suitable references reaches.

**Objective 2:** Restore natural stream flow regimes in order to provide migration corridors by eliminating anthropogenic loss of water from the Pearson Creek channel in areas of past channel alterations.

**Objective 3:** Restore fish passage by replacing the undersized culvert crossing on the County road using stream simulation concepts

**Objective 4:** Restore riparian vegetation in order to recover riparian function and habitat forming processes by establishing a suitable riparian (no disturbance) buffer along Pearson Creek.

## RESTORATION ELEMENTS

To meet the restoration targets, four project elements have been identified. These include 1) the reconstruction of 1,244 feet of new channel where the stream is currently channelized and bermed (Photo 1), 2) the replacement of the undersized culvert to restore aquatic organism passage at all ranges of flow and correct improper road drainage conditions (photo 5), 3) riparian revegetation using native woody plants, and 4) grazing management changes that include riparian fencing to protect and improve cutthroat trout habitat.

### Stream Channel Reconstruction

Surveys of the stream channel were conducted to determine the condition of the existing channel and to locate suitable "reference" reaches to be used as design templates. A reference stream reach is one that is naturally stable, functions near its ecological potential and is geomorphically appropriate to the treatment area. For this project, two reference reaches were identified on Pearson Creek. These include 1) a higher gradient confined B-type channel and 2) a lower gradient more sinuous E-channel in the lower treatment area (Table 1). The B-type reference reach was identified approximately ¼ mile upstream of the proposed project (Photo 3). The E-type channel was identified approximately ¼ mile downstream of treatment area (Photo 4). Small segments of the historic channel of Pearson Creek were also measured and will be incorporated with the new channel layout (e.g., Photo 5). Channel design information derived from reference reaches are shown in Table 1. Channel dimension conform to regional relationships of channel geometry (Lawler 2004) for natural stream of western Montana. Cross-section, longitudinal profile, pebble count data and station information is included in the Appendix.

| Channel Measurement | | | Pebble Count data (B-channel) | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Channel Measurement** | **B Channel** | **E Channel** | **Size class** | **Particle size (mm)** | **Substrate material** | **Percent** |
| Length of new channel | 301 | 883 | | | | |
| Bankfull Discharge (cfs) | 12 | 12 | | | | |
| Bankfull Width (ft) | 8.6-11.2 | 3.5-4.5 | D16 | 8.84 | Silt | 0 |
| Entrenchment ratio | 2.8 | >10 | D35 | 17.75 | Sand | 4.82 |
| Mean riffle depth (ft) | 0.95 | 2.5-2.8 | D50 | 22.08 | Gravel | 81.93 |
| Maximum pool depth (ft) | 3.2 | 3.5 | D84 | 57.81 | Cobble | 13.25 |
| Riffle width/depth ratio | 8.8-11.9 | 1.2-1.4 | D95 | 107.58 | Boulder | 0 |
| Bankfull area (sq. ft.) | 8.4-10.2 | 8.0-9.0 | D100 | 255.99 | Bedrock | 0 |
| Wetted Perimeter (ft) | 9.5-11.5 | 7.0-9.0 | | | | |
| Hydraulic radius | 0.88 | 0.69-0.89 | | | | |
| Channel Slope | 0.023 | 0.005 | | | | |
| Drainage Area (sq. miles) | 9.2 | 9.2 | | | | |
| Belt Width | 14 | 14(12-18) | | | | |
| Meander Length | 25 | 36 (32-39) | | | | |
| Sinuosity | 1.2 | 1.4 | | | | |

**Table 1**. Reference conditions for the reconstruction of two channel types on Pearson Creek.

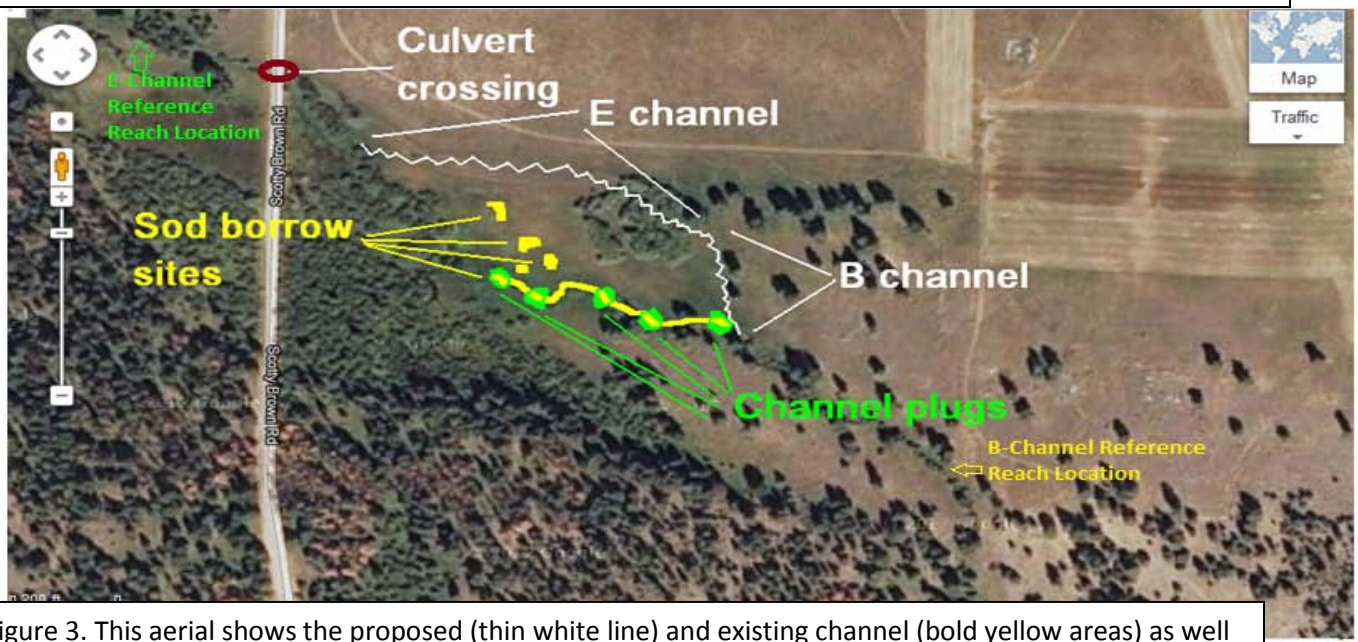


Figure 3. This aerial shows the proposed (thin white line) and existing channel (bold yellow areas) as well as reference reach locations. The sod-borrow areas emphasize the northern portion of the existing channel, however, small sod borrow sites may also be used.

**Photo 3**. Photo of the upstream reference reach taken in July, 2011. The upper (i.e., B-channel) portion of the new channel will have step-pool morphology using instream wood features typical of a small forested mountain stream.

**Photo 4**. Photo of the downstream reference reach taken in April, 2012. The lower portion of treatment (E-channel) stream will construct to similar meandering morphology using vegetative features typical of a small, lower-gradient meadow stream.

Photo 5: This photo shows a segment of this historical E-type channel just upstream of the county culvert. This segment will be used to the full degree possible.

In addition to reference reach surveys, channel and valley cross-sections were conducted to identify the best location for the new channel. Segments of the historic channel are located along the interface of the glacial river terrace along the Blackfoot River and alluvial fan Pearson Creek stream valley (Figure 2).

**Proposed Habitat structures**

The habitat structures typical of a B4 channel are shown in Figure 4. These features provide for pool- and riffle-forming processes and streambank stability by directing stream energy to the thalweg of the stream, while also providing for instream cover for trout during the interim recovery period. These features will be placed low within the bankfull channel at angles described by Rosgen (Applied River Geomorphology, 1996). Only structures consistent with native material found within Pearson Creek, including reference reaches, will be used.

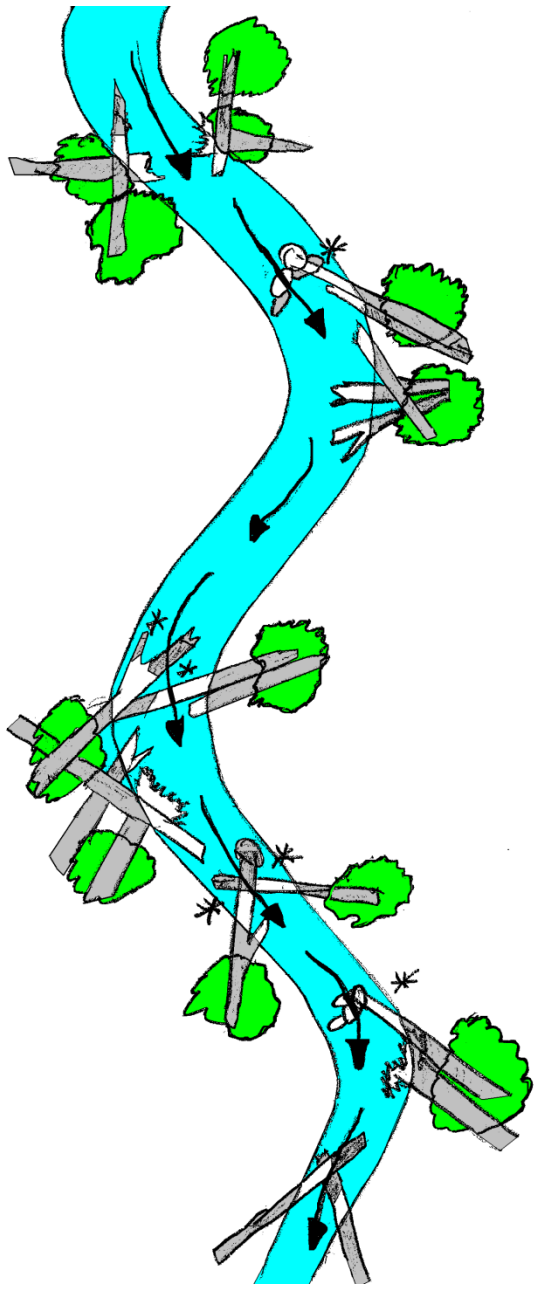

Figure 4. This figure shows the typical placement of habitat structures within the B4 Pearson Creek bankfull channel. Logs will be 12-18" diameter. Pools spacing will be 4-times bankfull width, or approximately every 25-30' feet. The buried portions of the wood structures are shown in grey. The green areas are shrub transplants over the buried log structures. The arrow shows the thalweg area of the new channel. An * shows the location of impermeable fabric is tacked to the upstream side of the vane structures to prevent piping during the initial recovery periods.

**Riparian Revegetation**

Riparian vegetation up- and downstream of the proposed project reach consists of a mixed conifer overstory with a mixture of willow, alder, aspen, hawthorn, serviceberry along the immediate riparian area. Throughout the project reach, historic grazing pressure and channel manipulations have limited recruitment of woody riparian species. In order to meet objectives of restoring a self-maintaining channel with a functional riparian zone, recovery of riparian shrubs will be an important component of the project.

In addition to shrub plantings, a grazing management plan which includes excluding the entire reach with a riparian fence and off-site water is planned. Approximately 3,000 willow stakes will be installed throughout the project reach after being collected by volunteers in dormant months. Transplants shubs (e.g., Figure 2) will also be incorporated throughout the project and we anticipate using up to 50 plants. Shrubs targeted for transplanting will be cut back to between 25% and 50% of existing height before transplanting. Pre-transplant trimming will minimize respiration and desiccation and will improve transplant success. Operators will bury the transplants 4 - 8 inches below original root collar level. Any disturbed areas will also be re-seeded with native riparian plant seed mixtures.

**Grazing Management**

In order to meet objectives of: 1) stabilizing the site through vegetation, 2) reducing grazing pressure on young seedlings, and 3) promoting the recovery of westslope cutthroat trout habitat, the landowner has agreed to fence the riparian area with a minimum buffer of 35 feet. 3,000 feet of three-strand barbed wire fencing is planned (meeting "wildlife friendly" guidelines). Off-site water is currently available.

**Road Crossing & Fish Passage**

Because of the perched location of the channel upstream of the country road, water approaches the culvert crossing from several directions. In addition, the existing 42" x 28” x 30' culvert is hydraulically undersized, impedes fish passage, and contributes to periodic flooding of the country road (photo 6). For the road crossing portion of the project, we are working closely with Powell Country Road Department to upgrade the culvert to a 7’ span x 4’ rise x 36’ long concrete box culvert. The new box culvert will have a natural stream bottom and accommodate bankfull dimension and discharges up to a 100-year event. At least one additional floodplain culvert is also planned at this site. Refer to *Pearson Creek Culvert* Plan & Elevation View drawing in included the Appendix.

**Photo 6**: This photo shows the undersized culvert. It also shows water flowing down the borrow pit to the culvert. Currently all base flows flow through the borrow pit of road.

**Equipment Specifications**

The channel restoration portion of the project will require 1) a medium-sized hydraulic excavator with hydraulic thumb, 2) a tracked skid-steer, and 3) track truck. All equipment used onsite will be pressure washed clean to remove or reduce the potential transport of noxious weeds. Spill kits will be maintained in an area that can be easily reached by each piece of equipment.

**Project Sequencing and BMP's**

Channel reconstruction will be conducted "in the dry." Once completed, the water will be released into the new channel incrementally in order to minimize turbidity and prevent the dewatering of lower Pearson Creek. Prior to the release of all water into the new channel, a fish rescue will be completed by Montana Fish, Wildlife and Parks. Once water is released into the new channel, the old channel will be reshaped into a series of discontinuous wetland cells (e.g., Figure 3). These cells will be constructed at terrace elevation in order to prevent water from entering the old channel and restore natural wetland function in the area of channel

incision. The road crossing will be replaced at low flows and existing flows will be routed around the project work area using a ”clear-water” diversion.

**Monitoring Plan**

The monitoring plan will consist of ongoing fish population surveys at the two sites identified in the fisheries section. In addition, the project will be monitored annually to ensure the project recovers. This annual walk-though will occur during the fish population monitoring period. Riparian revegetation efforts will be assessed for plant survival rates and if necessary, treated for browse from rodents, deer and elk. Transplants will also be watered during relevant summer months as necessary.

**Cooperative Agreement**

The Landowner has agreed to maintain the fences and to manage livestock for the recovery of the treatment area under a USFWS cooperative agreement.

**APPENDIX**